Instructions: Complete each of the following exercises.

Lagrange Multipliers

1. Use the Lagrange multipliers method to compute the extreme values of f subject to the constraint.
   (a) $f(x,y) = xy; \quad 4x^2 + y^2 = 8$
   (b) $f(x,y) = x^4 + y^4 + z^4; \quad x^2 + y^2 + z^2 = 1$
   (c) $f(x,y,z) = \ln(x^2+1) + \ln(y^2+1) + \ln(z^2+1); \quad x^2 + y^2 + z^2 = 12$

2. Find the extreme values of f subject to the constraints.
   (a) $f(x,y,z) = x + y + z; \quad x^2 + z^2 = 2, \quad x + y = 1$
   (b) $f(x,y,z) = xy + yz; \quad xy = 1, \quad y^2 + z^2 = 1$
   (c) $f(x,y,z) = x^2 + y^2 + z^2; \quad x - y = 1, \quad y^2 - z^2 = 1$

3. Find the points on the curve of intersection of the plane $x + y + 2z = 2$ and the paraboloid $z = x^2 + y^2$ which are nearest the origin and farthest from the origin.